

Session #6

New [Ambient Air Quality Standards](#) Analytic Challenges and Process Changes An FHWA Perspective of the Impacts on Small and Medium Sized Areas

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ABSTRACT

Significant changes to standards and regulations that influence [metropolitan transportation planning](#) in many areas were made in 1997. Specifically, the U.S. EPA issued both a new set of National Ambient Air Quality Standards([NAAQS](#)) and major revisions to the [Conformity Rule](#). The impacts of the new standards and the conformity rule are interrelated. For example the current conformity regulations are based on the [1990 Clean Air Act Amendment](#) nonattainment designations which in turn are based on the old NAAQS. Thus with new NAAQS one would expect new designations and a new set of conformity regulations. However, it will likely take EPA several years to collect the required monitoring data and make the new designations. Thus in the short term it appears that the new standards will have little impact. However, the medium to long term impacts of these changes on the planning processes and the analysis techniques employed by small-medium size areas is not yet clear. It does appear that the changes in the ozone and particulate matter standards will result in numerous new nonattainment areas, some of which will likely be considered small or medium-sized areas.

This paper will first provide background information on the new standards. Second, it will provide a review of some of the applicable transportation and air quality terminology. Third, the "current" air quality status of small and medium sized areas will be described and developing issues will be discussed. Finally, information will be provided which will assist small-medium sized areas in their preparations to meet the analysis requirements under the new standards and revised regulations.

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Introduction

The U.S. EPA issued new National Ambient Air Quality Standards(NAAQS) and revised the Transportation Conformity Rule in 1997. The focus on this paper will be on documenting the impacts to date and to the extent possible predicting the future impacts of these changes on transportation planning in small and medium-sized communities. However, before the impacts can be understood one must become familiar with some of the important aspects of these revisions.

New NAAQS

There are two types of NAAQS, primary standards which set limits to protect public health and secondary standards which are designed to protect public welfare. The U.S. EPA issues NAAQS for seven pollutants; Carbon monoxide (CO), Nitrogen Dioxide (NO₂), Ozone (O₃), Lead (Pb), Particulates <10 micrometers (PM₁₀), Particulates <2.5 micrometers (PM_{2.5}) and Sulfur Dioxide (SO₂). On July 17, 1997 the standards for ground level ozone and particulate matter were revised. The previous 1-hour ozone standard is being phased out and replaced with a more stringent 8-hour standard. The PM₁₀ 24-hour standard was updated and new standards for PM_{2.5} were added.

Transportation Conformity Revisions

With the intent of simplifying the conformity process and providing much need flexibility in making conformity determinations the EPA in July 1997 finalized a third set of amendments to the transportation conformity rule. Included in those amendments were several changes that may affect transportation planning in small and medium-sized communities classified as maintenance or nonattainment. Under the revised rule the build/no-build test is eliminated once state implementation plan (SIP) budgets have been submitted. Newly submitted SIPs replace the build/no-build and other emission reduction tests after a 45-day adequacy review period by EPA. Network modeling is now only required in serious and above ozone and CO nonattainment areas with an urbanized population greater than 200,000. However, areas currently using network models must continue to use them. The specific modeling criteria were streamlined and clarified, and additional modeling guidance will be issued in the future. Rural areas now have flexibility to choose among several conformity tests when demonstrating conformity for years beyond the time frame of the attainment SIP or maintenance plan. Additionally, the consequences of EPA disapproval of a SIP are less severe. Following EPA disapproval of a SIP without a protective finding, projects from the first three years of the currently conforming transportation plan and TIP can proceed(1).

Defining the terms

Becoming familiar with the terminology of air quality and transportation planning is the first step in understanding the linkage between the two. This section is intended to remind the reader of the definitions of some of the key terms used in this paper.

A "nonattainment area" is a locality where air pollution levels persistently exceed the NAAQS. Maintenance areas are geographic regions that were designated nonattainment and have

subsequently been redesignated to attainment subject to the requirement to develop a plan that will assure the standards are maintained. Conformity, simply defined, refers to the requirements that in nonattainment and maintenance areas the transportation plans and programs must "conform" with the purpose of the applicable SIP.

The Census Bureau defined "urban" for the 1990 census as comprising all territory, population and housing units in urbanized areas and in places of 2,500 or more persons outside urbanized areas. Rural areas as defined by the Census Bureau are areas with under 2,500 in population(2). The Transportation Research Board (TRB) builds on the definition of urban to define small and medium-sized urban communities as those with maximum population of 250,000. There are about 125 urban areas in the United States with a population greater 250,000 and probably several thousand communities that fit the broad definition of a small or medium-sized urban area.

For many transportation planning purposes the terms "urbanized" and "metropolitan" are more important than urban. For example all urbanized areas are required by Federal law to have a Metropolitan Planning Organization (MPO). The MPOs are required to define a metropolitan area that encompasses the current urbanized area and the area expected to be urbanized during the 20 year forecast period. An urbanized area as defined by the Census Bureau comprises one or more places and the adjacent densely settled surrounding territory that together have a minimum of 50,000 persons(3). Nationally there are currently 339 MPOs of which approximately 225 are in urbanized areas with a population of 250,000 or less(4). These definitions are very important for integrating the air quality and transportation planning processes. Based on these definitions the geographic areas that are required to meet the various planning requirements and the people impacted by them can be identified.

Pollutants

Of the seven criteria pollutants only ozone, carbon monoxide and particulates are currently given significant consideration in transportation planning. It is important to understand both the source and characteristics of pollutants if one desires to comprehend the prospects for a region complying with the NAAQS. The following is a brief description of these three pollutants.

Ozone

Ozone is not emitted directly into the air, but is formed by gases called nitrogen oxides (NO_x) and volatile organic compounds (VOCs) that in the presence of heat and sunlight react to form ozone. Ground-level ozone forms readily in the atmosphere, usually during hot weather. NO_x is emitted from motor vehicles, power plants and other sources of combustion. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants, refineries, factories, consumer and commercial products, and other industrial sources. Changing weather patterns contribute to yearly differences in ozone concentrations from city to city. Also, ozone and the pollutants that cause ozone can be carried to an area from pollution sources located hundreds of miles upwind.

CO

Carbon monoxide is a colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely. It is a byproduct of highway vehicle exhaust, which contributes about 60

percent of CO emissions nationwide. Other sources of CO emissions include industrial processes and fuel combustion in sources such as boilers and incinerators.

PM

Particulate matter originates from a variety of sources, including diesel trucks, power plants, wood stoves and industrial processes. The chemical and physical composition of these various particles vary widely. While individual particles cannot be seen with the naked eye, collectively they can appear as black soot, dust clouds, or grey hazes. As noted earlier EPA now maintains standards focused on "coarse" particles less than 10 micrometers in diameter ("PM₁₀") and "fine" particles less than 2.5 micrometers in diameter ("PM_{2.5}"). Fine particles result from fuel combustion, residential fireplaces and wood stoves or they can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. Coarse particles are generally emitted from sources such as vehicles traveling on unpaved roads, materials handling, and crushing and grinding operations, and even windblown dust.

Attainment Status

Overview

The situation regarding the nation's nonattainment areas is quite dynamic. Since by definition an area's nonattainment status is directly linked to the NAAQS, changes in the standards may result in a change in the attainment status of an area. Additionally, pollutant emissions levels and meteorological conditions vary over time in most regions of the country. Favorable meteorological conditions and/or reduced emissions may result in areas attaining the standards while growth in emissions and/or unfavorable meteorological conditions may result in violations of the standards. The general trend has been toward greatly improved air quality in the U.S. For the nation as a whole pollutant concentrations and the number of affected people have dropped steadily over the past 25 years.(5)

Due to the dynamic nature of the nation's air quality situation from both a scientific and regulatory perspective it is difficult to provide a status report with lasting value. It must be recognized that data provided at any point in time could be out-of-date very quickly. With this in mind a composite snap-shot of the first 8 months of 1998 was developed. As of January 17, 1998 there were a total of 150 geographic regions classified as nonattainment containing an estimated one hundred and seventeen million people. (6) About thirty of these regions were in nonattainment for more than one pollutant.

Small and Medium-Sized Areas

Table 1 is comprised of a subset of nonattainment areas that have a populations near or below the 250,000 threshold for small and medium-sized areas. These data indicate that as of January 27, 1998 there were 72 geographic regions in this category, nine of which were in nonattainment for more than one pollutant. At least 9 of these geographic regions and by some definitions 15 or more could be categorized as rural nonattainment areas.

Table 1: Small & Medium-Sized Nonattainment Communities (January 27, 1998)

#	State	Nonattainment Area	Number of Areas			Affected Pop.		
			O ₃	CO	PM ₁₀	O ₃	CO	PM ₁₀
1	AK	Anchorage		1	1		222	170
2	AK	Fairbanks		1			30	
3	AK	Juneau			1			12
4	AZ	Ajo			1			6
5	AZ	Bullhead City			1			5
6	AZ	Douglas			1			13
7	AZ	Miami-Hayden			1			3
8	AZ	Nogales			1			19
9	AZ	Paul Spur			1			1
10	AZ	Pavson			1			8
11	AZ	Yuma			1			54
12	CA	<i>Chico</i>		1			72	
13	CA	Imperial Valley			1			92
14	CA	<i>Lake Tahoe South Shore</i>		1			30	
15	CA	Owens Valley			1			18
16	CA	Searles Valley			1			30
17	CO	Aspen			1			5
18	CO	Canon City			1			12
19	CO	Fort Collins		1			106	
20	CO	Lamar			1			8
21	CO	Longmont		1			52	
22	CO	Pagosa Springs			1			1
23	CO	Steamboat Springs			1			6
24	CO	Telluride			1			1
25	DE	Sussex Co	1			113		
26	ID	Boise			1			125
27	ID	Bonner Co (Sandpoint)			1			26
28	ID	Pocatello			1			46
29	ID	Shoshone Co			2			13
30	MD	Kent and Queen Anne Cos.	1			52		
31	ME	Knox and Lincoln Cos.	1			67		
32	ME	Lewiston-Auburn	1			221		
33	MI	Muskegon	1			159		
34	MT	Butte			1			33
35	MT	Kalispell			1			11
36	MT	Lame Deer			1			0
37	MT	Libby			1			2
38	MT	Missoula		1	1		43	43
39	MT	Polson			1			3
40	MT	Ronan			1			1
41	MT	Thompson Falls			1			1
42	MT	Whitefish			1			3
43	NH	Manchester	1			222		3
44	NH	Portsmouth-Dover-	1			183		

#	State	Nonattainment Area	Number of Areas			Affected Pop.		
			O ₃	CO	PM ₁₀	O ₃	CO	PM ₁₀
45	NM	Anthony			1			1
46	NM	Sunland Park	1			8		
47	NV	Reno	1	1	1	255	134	254
48	NY	Essex Co.	1			1		
49	NY	Jefferson Co.	1			111		
50	NY	Poughkeepsie	1			259		
51	OH	Jefferson Co. (Steubenville)			1			4
52	OR	Grants Pass		1	1		17	17
53	OR	Klamath Falls		1	1		18	17
54	OR	LaGrande			1			11
55	OR	Lakeview			1			2
56	OR	Medford		1	1		62	63
57	OR	Oakridge			1			3
58	OR	Springfield-Eugene			1			3
59	PA	Altoona	1			131		
60	PA	Johnstown	1			241		
61	PR	Guavnabo Co.			1			85
62	UT	Ogden		1	1		63	63
63	UT	Utah County (Provo)		1	1		85	263
64	WA	Olympia-Tumwater-Lacey			1			63
65	WA	Spokane		1	1		279	177
66	WA	Walla Walla			1			47
67	WA	Yakima			1			54
68	WI	Door Co.	1			26		
69	WI	Manitowoc Co.	1			80		
70	WV	Follansbee			1			3
71	WV	Wier.-Butler-Clay			1			22
72	WY	Sheridan			1			13
		TOTALS	16	14	53	2129	1213	1939

Current Situation and Forecast for the Future

Tremendous progress has been made towards cleaning our nation's air in the past three decades. However, there is still work to be accomplished especially with regard to ozone and particulates. Though the full impacts of the revisions to the conformity regulations and NAAQS are still unknown this section provides a brief description regarding current conditions and what is anticipated.

Ozone

On May 27, 1998 EPA issued the final rule identifying areas where the old 1-hour standard for ozone no longer applies because there had been no current measured violation of the 1-hour standard. Nearly half of the areas reclassified as a result of this action were small and medium sized areas. After EPA's revocation of the old ozone standard the only small and medium-sized areas that remain in nonattainment for ozone are the six indicated by shading in Table 1 (7). However, twenty-two of the nation's forty-three ozone maintenance areas are either

small/medium-sized or rural.

The question for these areas now becomes "what next?". Estimates of the extent of the nation that would be classified as nonattainment under the new ozone standards range from about 20 areas up to two or three times that number. The current best guess based on the monitoring data available to date indicates that roughly 150 additional counties will be classified as nonattainment for ozone under the new standard(8)(9). Some of these counties will become part of existing nonattainment areas and others will comprise new nonattainment areas. However, EPA anticipates most of the new ozone nonattainment areas (at least in the northeastern U.S.) will not need to implement any transportation related measures. Their expectation is that most of these areas will reach attainment simply by complying with EPA's rule for regional NOx reductions(10). As indicated in Table 2 implementation of the new standard is expected to be a long process occurring over about 12 years.

Table 2: Important Dates on New Standards Implementation Time Line(11)

Date	Ozone	PM ₁₀ & PM _{2.5}
July 1997	New Standard Issued	New Standard Issued
May 1998	Old Standard Revoked	PM _{2.5} monitoring program ongoing
Fall 1998	New EPA guidance and rules released	EPA will issue anti-backsliding rule & revoke old standard case-by-case
2000	Traditional area designations	PM ₁₀ designations and classifications
2002-2003	Transitional area attainment dates & Traditional area SIPs due	PM _{2.5} designations begin as data becomes available
2005	Traditional area attainment dates set	Earliest PM _{2.5} SIPs due date
2008-2010	Traditional area attainment dates	Last Year for PM _{2.5} SIP submittal & PM _{2.5} attainment dates begin

CO

Long-term improvements regarding CO pollution continued between 1986 and 1995. National average CO concentrations decreased 37 percent while CO emissions decreased 16 percent. Long-term air quality improvement in CO occurred despite a 31 percent increase in vehicle miles traveled in the U.S. during that period(12). Violations of the CO standard have been virtually eliminated over the past two decades. In fact recently 8 CO areas in California lost their nonattainment status reducing the national total of CO nonattainment areas to 20. Chico and Lake Tahoe South Shore shown in italics in Table 1 were reclassified to attainment as part of this action. Though 12 of the 20 current CO nonattainment areas and 10 of the 33 CO maintenance areas are in small and medium sized or rural areas few actually have a serious CO pollution problem.

PM

Approximately 53 of the 77 PM₁₀ nonattainment areas and 4 of the 6 PM₁₀ maintenance areas are small or medium-sized communities. The number of new PM_{2.5} and new or expanded PM₁₀ nonattainment areas is still not clear at this point in time. The EPA has estimated that at least

several hundred counties will be designated as nonattainment for particulate pollution. However, the new particulate standards were created with limited knowledge of emission sources. The current method for determining PM_{10} emission factors--based on silt loading--is inadequate and uncertain when determining $PM_{2.5}$ emission rates. Current EPA regulations call for regional and project-level modeling of particulates, but approved methodologies have not been established. EPA has stated that full implementation of the standards will be deferred until such methodology can be developed. Although there has been some fine particle monitoring in the past a more comprehensive network is needed to support state planning and control efforts. The first priority for the fine particle standard, therefore, is to establish a comprehensive $PM_{2.5}$ network to measure ambient concentration across the country. The monitoring network will indicate the areas that have significant $PM_{2.5}$ pollution problems and identify the major sources of $PM_{2.5}$ in various regions. The initial network, designed and deployed by EPA and the States, will consist of approximately 1500 monitors. Table 2 provides highlights of the anticipated implementation schedule.

Clarifying the Issues and Developing Solutions

Several efforts designed to better understand the perceived needs of urban areas with regard to transportation planning have been undertaken recently. These projects include NCHRP Synthesis 252 "Response of Small Urbanized Area MPO's to ISTEA", a survey of over 100 small to medium sized metro areas by the Texas Transportation Institute and a nationwide survey of state departments of transportation and MPOs on conformity issues conducted jointly by the American Association of State Highway Transportation Officials (AASHTO) and the National Association of Regional Councils (NARC). Information gleaned from these and related efforts indicate that only 20 to 25 percent of small and medium-sized areas perceive air quality as a major transportation planning issue in their area. However, in areas where air quality is a concern it was usually identified as one of the top two issues facing them. Indications are that the portion of small and medium-sized areas that are required to address air quality issues in their planning process will likely increase significantly in the next several years. A great deal of attention is being given to the issues related to this topic. The remainder of this paper will highlight some of these efforts.

TEA-21

On June 9, 1998, the Transportation Equity Act for the 21st Century (TEA-21) was signed into law. Several provisions of this new statute are likely to impact transportation and air quality planning in small and medium sized urban areas. The TEA-21 includes revisions to the Congestion Mitigation and Air Quality Improvement Program (CMAQ) apportionment formula to include "stand-alone" CO nonattainment and maintenance areas several of which are small and medium-size metropolitan areas. The option to tailor the planning process to fit the complexity of the problem in areas under the 200,000 population threshold was retained. Metropolitan boundaries may now be maintained as they reflected nonattainment areas, at the existing limits on the date of the enactment of TEA-21, or they may be extended to reflect increases in nonattainment area boundaries at the discretion of the state's Governor and the MPO. For new MPOs, the boundaries should reflect the nonattainment area boundaries based on agreements

between the Governor and local officials(13).

DOT Assistance

The FHWA and other DOT agencies are actively working to assist small and medium-sized urban areas in their transportation and air quality planning efforts. Much of this assistance is developed and provided cooperatively with the U.S. EPA and other Federal Agencies. The following are samples of the ongoing projects that will help small and medium-sized areas in this regard.

Handbook for Technical Information and Procedures

The objective of this research project is to develop a reference book of simplified analytical procedures for obtaining and refining technical information needed for transportation planning in small and medium sized urban areas. The handbook will provide examples of procedures to be used in various situations, guide users through the appropriate decisions and steps to complete a particular analysis and direct planners to related documentation in other sources. The draft handbook will be ready for review in February 1999 and the final product should be available in September 1999.

Public Information Initiative

The US DOT and EPA have launched pilot programs aimed at enhancing public involvement in voluntary behavioral changes to reduce congestion and improve air quality. The primary goal of the project is to build national and local coalitions of public and private organizations geared toward changing attitudes and behavior related to transportation and air quality. The program was pilot tested this summer in three areas including one medium-sized area, Dover, Delaware. The program may be expanded to as many as 12 cities in the 1999 ozone season depending on the evaluation of the pilot projects.

Basic Guide To Conformity

Transportation Conformity A Basic Guide for State and Local Officials as the title implies was not designed for planning agency staff. However, this 22 page document is a very good primer on transportation conformity issues and is well suited for folks who have not faced conformity issues in the past. Though it doesn't provide detail descriptions of the many nuances of the transportation conformity regulations it does define the key terms, list actions subject to conformity, explain roles and responsibilities and provides a cursory description of other basic conformity issues.

Conformity Reference Guide

The FHWA is developing a *Transportation Conformity Reference Guide* designed to facilitate compliance by State and local agencies with the transportation conformity requirements. The reference guide is not intended to be a "cookbook" on how to work through the transportation conformity process nor does it prescribe how to make a conformity determination. It is instead a manual that contains transportation conformity rules and relevant preamble language, questions and answers, and resource lists. Designed to be useful to both seasoned practitioners and conformity novices alike the guide is organized according to the transportation conformity provisions that apply to all nonattainment and maintenance areas followed by requirements

specific to certain pollutants or designations. It is anticipated that the guide will be available in late 1998.

Interagency Consultation: The Key Toward Collaborative Decision -Making

Based upon a review of interagency consultation processes from across the nation, the FHWA has compiled successful examples of state and local agencies and their efforts to improve the transportation conformity process. Findings of this report suggest that interagency consultation if performed early in the metropolitan planning process may result in better state and local decision-making at the regional level.

Research

A number of research efforts are either currently underway or will begin shortly that address various aspects of the air quality and transportation linkage. These projects range from basic research regarding the source and nature of particulate pollution to the specific analytic needs of small and medium-sized MPOs. The large number of related efforts prohibits inclusion of them all, however a select few of the most relevant are briefly described.

MOBILE Emission Factor Model

The EPA's highway vehicle emission factor model, MOBILE, provides average in-use fleet emission factors for VOCs, CO and NO_x. It is used by States (except California) and other local and regional planning agencies in the development of emission inventories and control strategies for SIPs and in the development of environmental impact statements (EISs). The EPA is currently working on a major update to the model, MOBILE6, which is scheduled to be released late in 1999. Revisions to MOBILE6 include: Facility-based emission factor estimates (different average emissions for different roadway types, even at similar average speeds), "real-time" diurnal emission factors; updates on the effects of oxygenated fuels on CO emissions, separation of "start" and "running" emissions, to permit more precise temporal and spatial allocation of emissions; updates to many other parameters based on new data. It is likely that the development of the next version of EPA's particulate emission factor model, PART5, will not begin until after the revisions to the MOBILE model are complete.

Quantification of Impacts of Seasonal and Episodic Public Education Programs

The cooperative agreement between FHWA, California Air Resources Board (CARB) and U.S. EPA seeks to gather the necessary information to develop emission reduction quantification guidelines for episodic and seasonal education programs. The project will provide sets of quantification methodologies, using both state-of-the-art tools and less costly approaches, to local jurisdictions involved in such programs. Development of such standard quantification techniques should remove the need for state and local governments to design their own unique methods for each program.

National Cooperative Highway Research Program (NCHRP)

An extensive list of NCHRP research projects related to the topic of transportation and air quality are in various stages of completion. One example is NCHRP Project 20-7 which has allocated \$100,000 to track the evolution of the regulatory development associated with the new NAAQS for ozone and PM_{2.5} and to keep the state departments of transportation informed. Other examples include the following: *NCHRP Report 394*, *NCHRP Project 25-15*, *NCHRP Project 25-11*, *NCHRP Project 25-14*, *NCHRP Project 25-17*, *NCHRP Project 25-18* and *NCHRP Project 8-33*.

Conclusions

EPA's overall strategy and time line for implementing the new ozone and PM standards thus far appears to be consistent with its billing as a "common sense" approach. However, we all recognize that the "devil is in the details" which with regard to these revised standards are yet to be developed. The best guidance available at this point for planners is to stay informed of the evolving regulatory process at the national level and proactively seek to be involved at the local level. If the recent past is a good indication then the bureaucratic and analytic burden will continue to increase on transportation planners as they contribute to efforts to solve the nation's air pollution problems.

It is premature to offer anything more than general expectations of the extent to which the new and revised standards will impact the number and size of nonattainment areas. However, it is instructive to note that the vast majority of the 16 small and medium-sized ozone nonattainment areas have a population in the tens of thousands or even 100's of thousands. However, the opposite is true of the PM₁₀ nonattainment areas most have a population of less than 50,000. This agrees with other data that suggest that ozone has been predominately a large urban area problem and PM₁₀ has had a greater impact in smaller urban and rural areas. These differences are primarily due to the nature of the emissions that cause the pollution problems. A large portion of PM₁₀ emissions are from windblown dust and reentrained dust due to agricultural operations or driving on unpaved roads while ozone precursor emissions are often from the operation of engines and commercial establishments. Though the science is still lacking with regard to PM_{2.5} some data indicate its impacts may be a "hybrid" of ozone and PM₁₀ resulting in both large and small urban areas being designated as nonattainment for PM_{2.5}(14).

Finally, in the short term it appears that the new standards will have little impact. However, the medium to long term impacts of these changes on the planning processes and the analysis techniques employed by small-medium size areas is not yet clear. It does appear that the changes in the ozone and particulate matter standards will result in numerous new nonattainment areas, some of which will likely be small or medium-sized areas.

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